BRAILLE DISPLAY

FIELD OF INVENTION

This invention relates to tactile Braille displays.

BACKGROUND OF THE INVENTION

A tactile Braille display comprises an array of six pins with three equally spaced pins in each of two parallel columns. Each pin is selectively movable between an elevated position and a lowered position so that there are **64** permutations of possible positions for the six pins. The display can be touched by a blind or visually impaired person and a character, such as a numeral or letter, can be indicated by the positions of the pins similar to the traditional Braille display comprising punched card or other relief patterns.

It is difficult to provide a practical electrically driven tactile Braille display since the requirements include small size and low power. Such displays can use piezoelectric or electromagnetic actuators for the pins. One disadvantage of the piezoelectric actuators is the continuous power consumption needed to maintain the pins in either one of the elevated or lowered positions, even if the display is not being read but is to be maintained for later reading by the user.

It is an object of the present invention to provide an improved Braille display which enables electrically controlled movement of the pins and enables low power consumption to be achieved.

SUMMARY OF THE INVENTION

According to the present invention there is provided a Braille display for denoting characters by the positions of six movable projections arranged in two parallel columns with each column comprising three of said projections, each projection being movable between an elevated position and a lowered position, actuator means for selectively moving each of the projections between its said two positions, the actuator means comprising rotary means having different rotary positions, the rotary means being operatively coupled to the projections so as to effect movements of the said projections, the rotary means in said different rotary positions causing said projections to adopt different predetermined permutations of the elevated and lowered positions of the projections corresponding to respective characters to be denoted by the Braille display, the actuator means further including drive means for selectively rotating the rotary means between its different rotary positions.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the present invention will now be described with particular reference to the accompanying drawings, in which:

FIG. **1** is a vertical sectional view through a magnified Braille display cell embodying the present invention,

FIG. **2** is an sectional view along the line II—II in FIG. **1**, and

FIG. **3** is a schematic perspective view of an elongated Braille display comprising numerous individual six pin Braille display cells according to the present invention.

DETAILED DESCRIPTION

In the drawings, the Braille cell **16** comprises six projections in the form of pins, three of which are indicated in FIG. **1** by the numerals **10, 11, 12**. Pins **10, 11** are shown in their elevated positions and pin **12** is shown in its lowered position. The pins **10, 11, 12** are spaced apart, e.g. by 2.5 mm approximating the standard Braille pin separation. The pins **10, 11, 12** are movable vertically in a guide block **15** which has bores therethrough for slidably receiving the pins. A complete Braille cell **16**, as shown in FIG. **3**, comprises two columns each having three such pins **10, 11, 12**, the columns being about **5**mm apart.

Each of the pins **10, 11, 12** preferentially adopts its lowered position and therefore may have an associated biasing spring **20, 21, 22** which biases the respective pin towards its lowered position–see pin **12**. However, the pins may be movable to their lowered positions under their own weight, enabling elimination of the biasing springs if desired.

Actuator means **30** moves the pins **10, 11, 12** against the action of springs **20, 21, 22** to adopt their elevated positions (pins **10** and **11**) and allows the pins to retract to their lowered positions under the action of the associated springs (pin **12**). The actuator means **30** comprises a rotary means, shown as cam means **31**, in the form of two similar cylinders having depressions **32** at predetermined positions around the circumference of the cylinder and in registry with respective heads **33** of the pins. Each cylinder **31** actuates a column of three pins. As best seen in FIG. **2** rotation of the cylinder **31** allows the head **33** to enter the depressions **32** under the action of the associated biasing spring **21** or, alternatively, the head **33** can lift out of the depressions **32** as the cylinder rotates to thereby move the respective associated pin **11** to its elevated positions as shown.

In FIGS. **1** and **3**, the cylinder **31** is driven by a motor **35**, such as a small stepping motor, through shaft **36** between eight possible rotary positions corresponding to rotational increments of 45°. By providing eight rotary positions, eight different permutations of positions of the three pins **10, 11, 12** can be provided by a suitable arrangement of the depressions **32**. Thus by providing two motors **35** per Braille cell as shown in FIG. **3**, all sixty four possible permutations of the positions of the six pins in the Braille cell **16** can be provided by selective independent rotation of the two cam cylinders **31** in 45° increments.

In an alternative construction of the cam means to the cylinder illustrated, the cam means may comprise three cam sections mounted co-axially on the motor shaft **36**, each cam section being associated with a respective one of the pins and having a predetermined profile to move the respective pin as desired. In both the illustrated embodiment having a cam cylinder **31**, and the alternative possibility of three cam sections mounted co-axially, the location and configuration of the cam profiles can be designed to ensure that as the motor is rotating the cam means between its rotary positions, only one pin is ever being moved at any instant. That is, during any incremental rotary movement through 45°, even if two or three pins are to be moved between their respective positions, at any one instant, only one pin is being moved, but by the time the 45° movement has finished, all the pins desired to be moved have been moved. This helps to distribute the torque loading on each motor by ensuring that a peak torque loading caused by attempted movement of two or three pins simultaneously is avoided.

It will be seen that, in the illustrated arrangement